Guaranteed Technical Particulars of RTU for RMU

Item	Description	RTU for RMU {as Proposed)
1	RTU Availability of 99.9%.	
2	Maintainability: 1) Self-diagnostics initiated from the DAS. 2) On-line error detection and reporting to DAS. 3) Local indication of RTU failures.	
3	Expandability solely by card or circuit module additions.	
4	Environmental Requirements 1) Temperature range 5 to 55°C. 2) Relative humidity 10 to 95% non-condensing. 3) Altitude at least 1,000m.	
5	Overload Protection: 1) Normal mode: 120 V (dc or ac peak). 2) Any terminal and ground: 240 V (dc or ac peak). 3) Overload effect on adjacent channel: less that 0.1% of full scale. 4) No damage to RTU at other than I/O where imposition of overload voltage is less than 600 V (dc or ac peak).	

	5) Availability of overload test results and. identification of applicable international standard.	
6	SWC per ANSI C37.90a (otherwise bidder to provide standard against which successful SWC tests have been conducted). Provision of Surge Protection Devices (SPDs) for Power Supply, RS-232 communication port, MFM communication port and Protection relay communication port.	
7	Electrostatic & Electromagnetic Compatibility 1) IEC 61000-4-2 Level 2 (or per bidder named equivalent) 2) IEC 61000-4-3 Level 2 (or per bidder named equivalent) 3) CISPR 22 Class A (or per bidder named equivalent) 4) IEC 61000-4-5 Level 2 (or per bidder named equivalent).	
8	Noise Level not exceeding curve NC-45 per ANSI C37.1 8	
9	Assembly & Component Identification. 1) Markings provided to properly identify all components 2) Card cages and slots clearly labeled	

	3) Cards properly keyed or designed so as to not cause damage or malfunction if plugged in to wrong slot.	
10	Interconnecting Cables & Wiring: 1) Bid inclusive of all cables and wiring for connecting RTUs to RMU terminals. 2) All wires and cables to use copper conductors and flame retardant insulation. 3) Interconnection cables to be properly color-coded and labeled.	
11	RMU-RTU Interface Connectors: Provision of 6x24-pin male connector and cable connecting RMU to RTU I/O points.	
12	Provision of Terminal Blocks where necessary.	
13	Support Facilities: Provision of hardware, software, firmware, and documentation necessary to configure and repair RTU. Provision of 2m LAN cable, however, the length of the cable shall be decided during design phase.	

14	Data Acquisition : 1) Provision of necessary wetting voltage, sensing voltage, current{ limiting, input isolation, and bounce filtering for all status inputs. 2) RTU's digital input point capacity (minimum as per Clause 3.1.1 and 3.1.5 of Technical specification). 3) RTU's meter data capacity (minimum as per Clause 3.1.1 and Clause 3.1.5 of Technical Specification). 4) RTU's protection relay data capacity (minimum per Clause 3.1.1 and Clause 3.1.5 of Technical specification).	
15	Device Control: **1)** RTU's device control point capacity (minimum per Clause 3.1.2 and 3.1.5 of Technical specification). 2) Provision of RTU local/remote switch. 3) With switch in remote position, normal monitoring and control enabled from the DAS. 4) With switch in local position, capability of monitor the RMU remotely as well as control RMU devices via the RTU front panel.	

16	Identify I/O point types and corresponding total capacities including all spares that will be delivered with the proposed RTU.	
17	Local Operator Smart Display 1) Smart Display–based Local Operator Panel designed and suitable for RMU for local monitoring, control, alarm indication, and event recording. 2) Smart Display shall be a full-colour high-resolution LCD/IPS type with a minimum resolution of 480 × 272 pixels (or higher). 3) Provision of dedicated Trip and Close buttons along with switch select allowing Local control of all LBs and CBs of RMU. The buttons have to be configured with a range of security options. 4) Provision of integrated Sequence of Events (SOE) recorder with 1 millisecond time-stamping accuracy and sufficient non-volatile memory for event storage.	
18	RTU Front Panel 1) Provision of Local Operator Smart Display (refer to Item 17 above). 2) Availability of RTU front panel connectors and	

	ports (provide details including number of ports and types) allowing Laptop PC to be used for RTU configuration and diagnostics and DAC simulator to be used locally to simulate DAS monitoring and control of RMU).	
19	PLC Capability compliant with the IEC 61131-3 standard.	
20	Interface with RMU MFMs & Numerical Relays 1) Provision of RS485 communications capability using MODBUS (identify number of corresponding communication ports provided). 2) Provision of 1.5m communication cable for MFM, however, the length of the cable shall be decided during design phase. 3) Provision of 1.5m communication cable for Protection relay, however, the length of the cable shall be decided during design phase. 4) The RTU shall have the capability to receive write commands from the Master Control Center and securely write	

	set-point and control values to connected protection relays via supported Modbus protocols.	
21	External Communications Interface 1) Number of Ethernet and Serial ports for RTU communications with the DAS. Minimum of one Ethernet TCP/IP (RJ45) port and one Serial (RS-232C) port / through OFC convertor port required. Both ports shall be capable of operating at 9.6 kbps (or higher) in conjunction with OFC or other communications system provided by others. Only one of these ports, however, shall be used for DAS communications at any given time. 2) Capability of these ports to serve local testing and backup functions as well as possible future applications such as dial-up connections and non-operations data collection.	
22	Communication Protocols 1) Provision of DNP 3.0 and DNP/IP Protocols for Ethernet and serial ports allowing RTU interoperability with DAS Master station, however, the Communication protocol shall be decided during design phase.	

	2) Provision of DNP3 secured authentication for RTU as per IEEE 1815. 3) Provision of MODDBUS allowing RTU interoperability with RMU's MFMs and Relays (also refer to Item 21 above).	
23	Status/Analog Reporting Modes: 1) Capability of RTU to report by exception when polled by the DAS. 2) Capability of RTU to report on an unsolicited basis. 3) Capability of RTU to report all data point values in response to @ DAS general interrogation poll. 4) Capability of RTU to report selected data point values in response to a DAS demand scan. 5) Provision of programmable scan rates and dead bands including capability to program dead points on an individual point basis.	

24	Select-Check-Before-Execute Control Security 1) Capability of RTU to support a select-check-before- execute command. 2) Capability to define the RTU time in which reset will occur before receiving an execute command {nominally 10 seconds).	
25	Provision of message security (error detection) code,	
26	Capability of RTU to simulate a response to a control output message.	
27	RTU Time Synchronization 1) Ensure RTU clock time does not drift by more than 1 second per day independently of synchronization from the DAS Master. RTU shall be designed such that, during restart or power restoration, the system does not go to default time and remains synchronized with DAS/SCADA using an internal clock battery-supported RTC (Real Time Clock). 2) Contractor to identify accuracy of RTU clock's crystal in parts per million. 3) Capability of RTU to time tag operations (real-time) data and possible future	

	non-operations data. 4) Capability of RTU to be synchronized via the DAS using relevant features of the DNP 3.0 and DNP/IP communications or possibly using NTP. 5) Capability of RTU to issue time sync signals to Protection relay.	
28	Power Supply 1) RTU capability to accept 24 VDC from RMU power supply unit. 2) Contractor to identify the DC voltage variations that the proposed RTU can tolerate and still operate reliably (per Employer specification: 16 to 32 VDC). 3) Provision of 1.5m 24VDC power supply cable, however, the length of the cable shall be decided during design phase.	
29	Enclosures & Space Requirements 1) Contractor to provide the dimensions of the proposed RTU, as supplied in its own enclosure. The size of the RTU enclosure shall be decided during design phase. 2) Contractor to identify the protection index to which the proposed RTU	

	enclosure conforms. 3) RTU enclosure to have a lockable door. 4) RTU to be accessible from the front for maintenance and trouble shooting. 5) All RTU enclosure's cable entries shall be protected against insect and cable entry and shall be sealed to prevent dust and sand contamination. 6) RTU enclosure to be provided with separate safety and signal grounds.	
30	Design Characteristics: It shall not be necessary to perform modification firmware, logic, or data expansion to use the RTU within the specified sizing parameters.	
31	Initialization/Restart Program 1) Capability of the proposed RTU to restart itself upon manual request, remote restart from DAS Control Centre and automatically under power restoration, memory parameter errors, and hardware failures. 2) Capability of RTU to report restarts to the DAS.	

32	Clarify capability of RTU to monitor and report to the DAS hardware, memory, CPU, communication, and input/output errors, faults, and/or failures.	
33	In case of irrecoverable faults, capability of RTU to place itself in secure state prohibiting transmission of false indications or execution of erroneous control.	
34	Database Maintenance 1) Provision of software for RTU database configuration that includes error detection services and capability to print input- data as well as resulting configuration details. 2) Capability to support the downloading of RTU configuration and processing parameters from the DAS (bidder to describe all download features of the proposed RTU). Capability to support Object 34 and Object 17. 3) RTU shall support deadband functionality with both read and write capability. It shall be possible to configure, modify, and read back deadband values for analog points from the	

	SCADA/DAS system or engineering workstation without requiring RTU restart. 4) RTU shall display the name and version of the current Configuration file in the RTU web page.	
35	Diagnostic Firmware 1) Provision of firmware for off-line and on-line diagnostics (bidder to describe all diagnostic features supported by the proposed RTU). 2) Capability to report off-line diagnostic state to DAS.	
36	Data Security 1) RTU shall support cyber security conformance testing of communication protocols as per the guidelines of Ministry of Power, Government of India and its amendments. 2) RTU shall be tested for DNP 3.0 secure, DNP 3.0 and DNP/IP in a lab certified by GOI. 3) Provision of MAC binding for securing the external access. 4) Provision of Password for maintenance access. The System shall provide facilities to support the	

	following requirements: 1) A combination of upper and lower case alphabetic, numeric and special characters shall be used. 2) The minimum password length shall be configurable by the Employer, and initially set to 7 characters.	